NAVSHIPS 362-0971

Part 2 Chapter 2B

Technical Manual

NAVY TYPE ACB

600 FRAME SIZE

AIR CIRCUIT BREAKER

WESTINGHOUSE TYPE DBN-40S
DIRECT CURRENT

WESTINGHOUSE ELECTRIC CORPORATION
EAST PITTSBURGH, PENNSYLVANIA, U.S.A.

WESTINGHOUSE TECHNICAL MANUAL 35-224-C13

BUREAU OF SHIPS • NAVY DEPARTMENT • APRIL, 1958

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AIR CIRCUIT BREAKER
Navy Type ACB (Westinghouse Type DBN-40S)
600 Frame Size
(Special Interrupting Rating - See Page 3)

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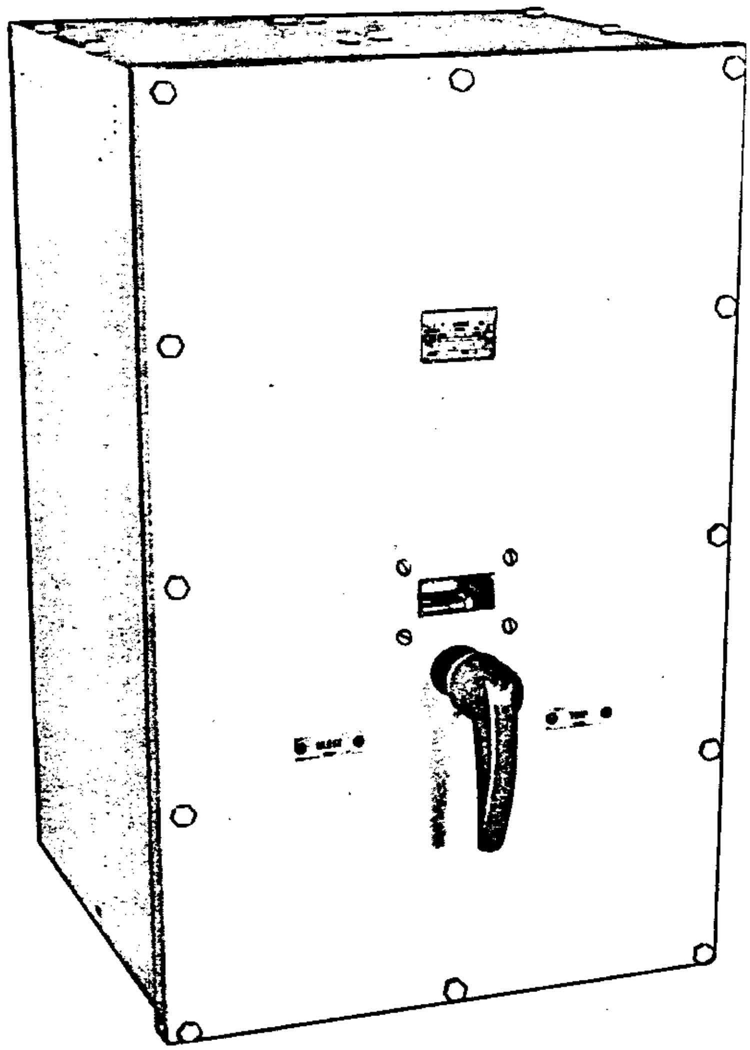

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SECTION A—INTRODUCTION

A-1. LIST OF ILLUSTRATIONS

A-2. CIRCUIT BREAKER DIMENSION PLAN

Figure 1 gives the outline dimensions for the Navy type ACB 600 frame size air circuit breaker, Westinghouse Corporation Type DBN-40S direct current breaker in enclosure.

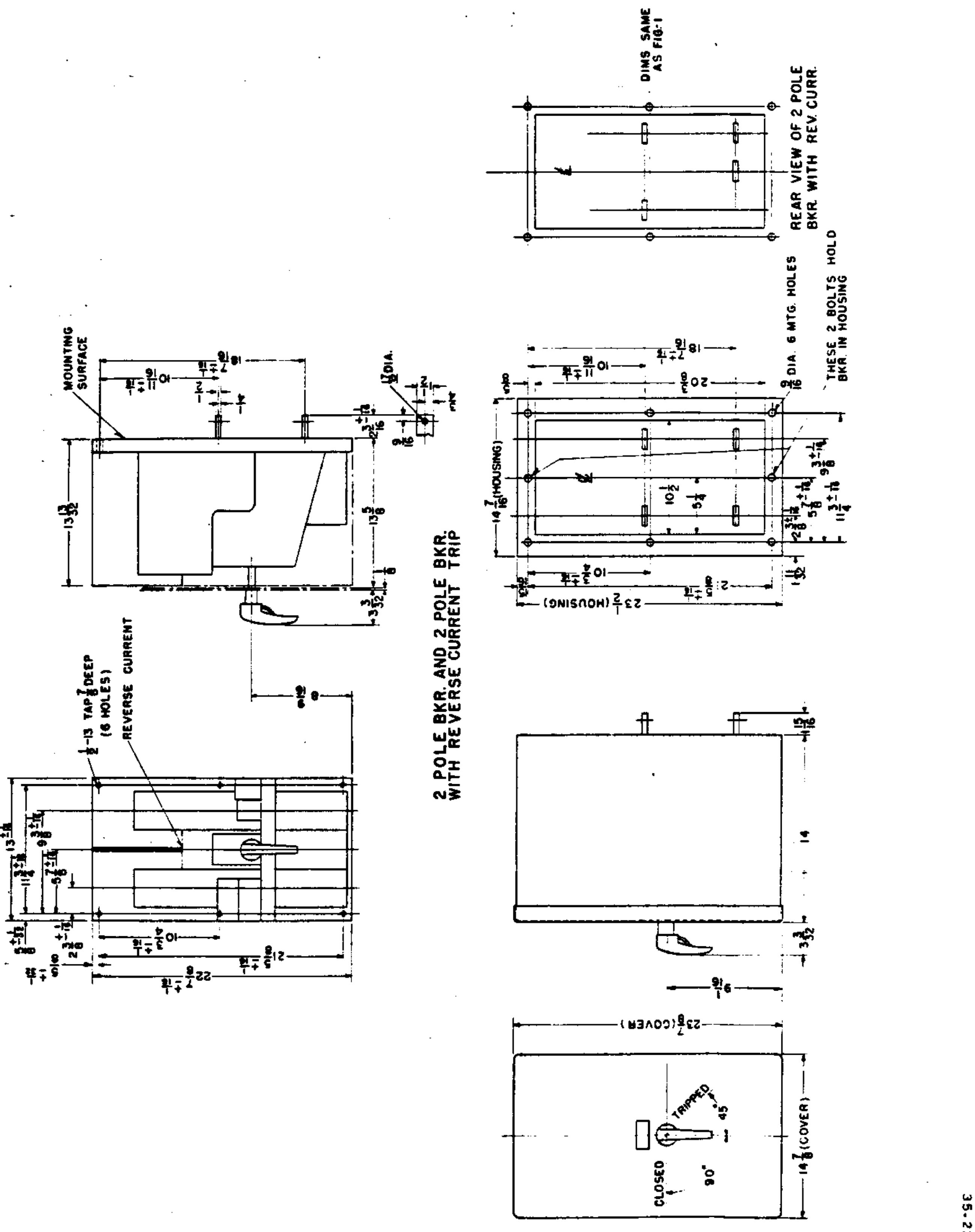


FIG. 1 — Outline Dimensions

SECTION B—GENERAL INFORMATION

B-1. MANUALLY OPERATED CIRCUIT BREAKER

The DBN-40S air circuit breaker is a sturdy, compact piece of shipboard electrical equipment consisting of a rigid steel chassis to which are bolted the several sub-assemblies which make up the complete circuit breaker. For example, the mechanism, pole units, arc chutes, overcurrent trip devices and other attachments are each complete within themselves and are readily interchangeable between breakers. They may be removed intact and replaced if necessary with minimum outage time.

The DBN-40S is a type ACB air circuit breaker of 600 frame size. Its interrupting and continuous current ratings are as outlined in the following table:

INTERRUPTING RATING

355 VOLTS D-C
100,000 AMPERES*

*Non-inductive circuit as demonstrated in test at New York Naval Laboratories under Project 5258-18.

CONTINUOUS CURRENT RATING

Circuit Breaker Copper Rating Amperes	Overcurrent Trip Coil Rating Amperes
	480
1200	900
	1200

The chassis of the air circuit breaker consists of a rigid steel panel (150) Fig. 2 on the front of which is bolted a supporting frame consisting of a bracket (151) which in turn supports shelf (152). A separate pole unit (100) is bolted to the steel panel for each pole. The base of each pole unit is molded from insulating material. When supplied, the series overcurrent trip devices (400) are bolted to the lower part of the pole unit base. The moving contact assembly is pivoted at its lower end on the pole unit base and is connected to the lower stud either directly or through a series overcurrent trip device. The stationary contact assembly is connected directly to the upper stud. The moving contact assembly opens and closes the electric circuit by moving out and in from the stationary contact assembly. An arc chute is mounted above and surrounding each pair of contacts. Its purpose is to stretch and cool the arc drawn when the contacts separate so that it may be readily extinguished.

The operating mechanism (200) is located on the breaker shelf (152) and transmits the force for closing the breaker from the operating handle (166) to the cross bar (168) and thence to the moving contact assembly through insulating links. The mechanism then latches and holds the contacts in the closed position. The circuit breaker is closed manually by releasing latch (224) operating handle (166) and then turning the operating handle (166) 90° clockwise and it may be tripped manually by turning the handle 45° in the opposite direction. Automatic tripping is accomplished by one of the automatic devices which lift the trip bar when suitably energized. These devices consist of the shunt trip (500) and the series overcurrent trip (400) and the reverse current trip (600) any or all of which may be supplied with an individual circuit breaker. One or more auxiliary switches (550) and a terminal block are supplied depending on the number of control and auxiliary circuits to be controlled by the operation of the circuit breaker.

The main power circuit through the circuit breaker consists of the lower stud, series overcurrent trip coil (if supplied), shunt, moving contact assembly, stationary contact, and upper stud, all connected in series in the order named.

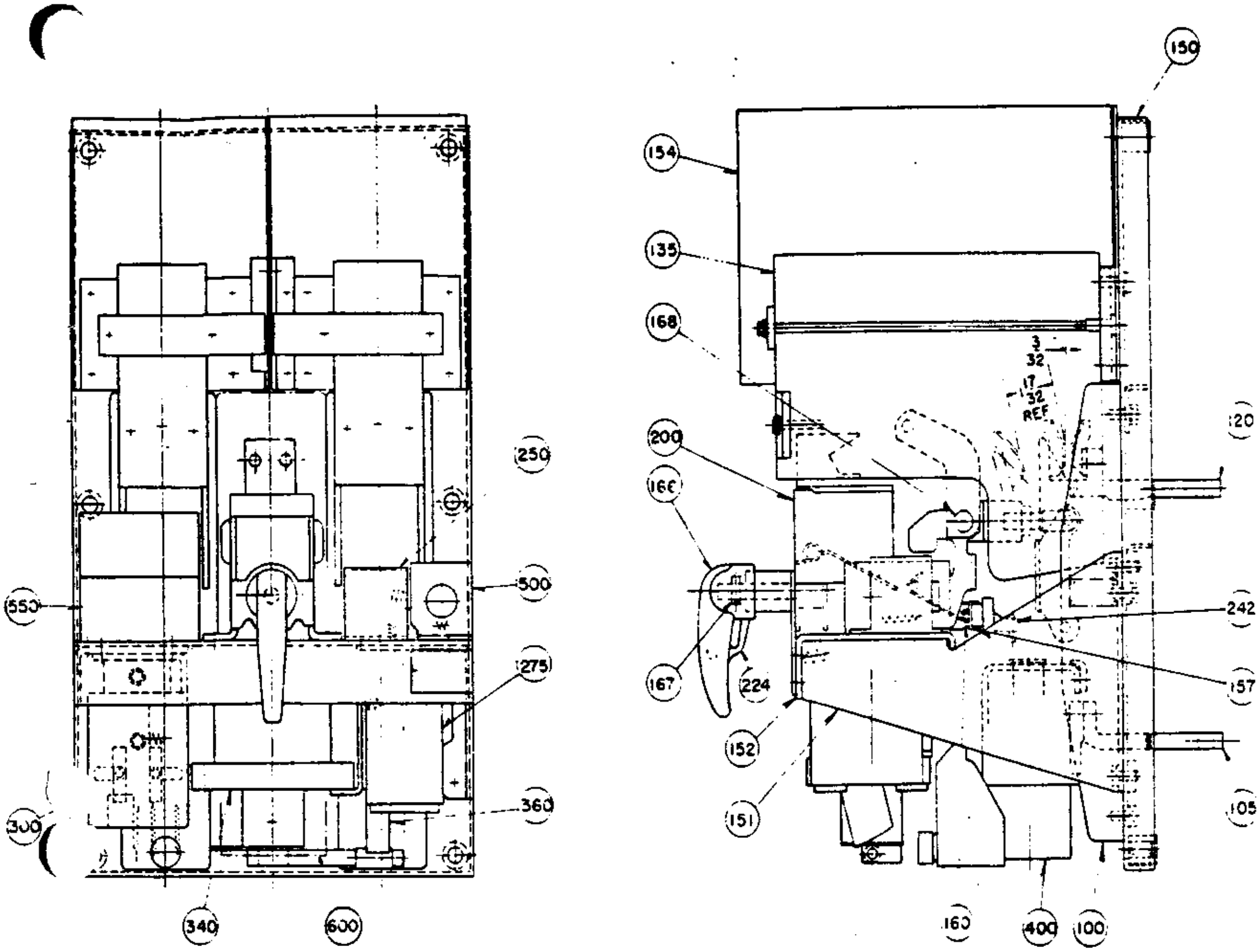
MOUNTING

DBN-40S circuit breakers are supplied in individual enclosures, see Fig. 1.

B-2. ELECTRICALLY OPERATED CIRCUIT BREAKER

The electrically operated circuit breaker is basically the same equipment described in Section B-1 with the exception that it is equipped with a closing magnet (340), a closing relay (300), and a shunt trip coil. These three attachments plus a source of closing power and a control switch enable an operator to close the circuit breaker from a remote point.

It should be noted that the addition of a closing magnet for electrical operation does not in any way change the manual operation features of the circuit breaker.



100	MOLDED BASE
105	LOWER STUD
120	UPPER STUD
135	ARC CHUTE
150	STEEL PANEL
151	BRACKET
152	SHELF
154	BARRIER
157	TRIP BAR
160	ELASTIC STOP NUT
166	OPERATING HANDLE
167	5/16-24 SET SCREW
168	CROSS BAR
200	MECHANISM
242	TRIP FINGER
250	ANTI-SHOCK-OPEN DEVICE
275	ELECTRIC LOCKOUT
224	LATCH-HANDLE
300	CLOSING RELAY
340	CLOSING MAGNET
360	ANTI-SHOCK-CLOSE DEVICE
400	OVERCURRENT TRIP
500	SHUNT TRIP DEVICE
550	AUXILIARY SWITCH
600	REVERSE CURRENT TRIP

FIG. 2 — General Assembly

SECTION C—OPERATION AND MAINTENANCE

C-1. CAUTION

Before working on a circuit breaker, the load and control circuits feeding it must be de-energized. The breaker should be in the "OPEN" position, but it should be noted that all circuit breaker studs are not necessarily "dead" when the circuit breaker is open.

Before putting the circuit breaker in regular operation it should be closed and tripped manually several times to see whether all parts are in proper alignment and move freely. Particular care should be taken to make sure the studs have not been forced out of alignment by the bus work. Lift the trip bar by hand with the circuit breaker open to make sure that it does not bind.

C-2. WIRING DIAGRAMS

Reference Figure 3

Figure 3 shows the typical control wiring for a DBN-40S breaker. For complete details refer to applicable diagram in the Switchboard Instruction Book.

C-3. SHUNT TRIPPING

Shunt trip coils have a nominal voltage of 250 volts and a voltage range of 140 to 355 volts.

C-4. ELECTRIC CLOSING

Closing coils and relay coils have a nominal voltage of 250 volts d-c and a voltage range of 200 to 355 volts.

C-5. MAINTENANCE

The frequency of inspection for maintenance will depend upon local conditions but, in general, a complete inspection for preventive maintenance should be made at least once a year. It is recommended that a special inspection be given any breaker that has opened a heavy short-circuit current.

If excessive heating not caused by overcurrent is observed, look for loose or corroded contacts or connections.

When inspecting the circuit breaker, examine the contact surfaces. Rough or high spots should be removed with a clean file or sandpaper. Do not use emery cloth since the dust from this material is a good conductor of electricity and is sure to cause trouble if allowed to settle on insulating surfaces.

More detailed maintenance instructions are given later on in the sections on the individual attachments.

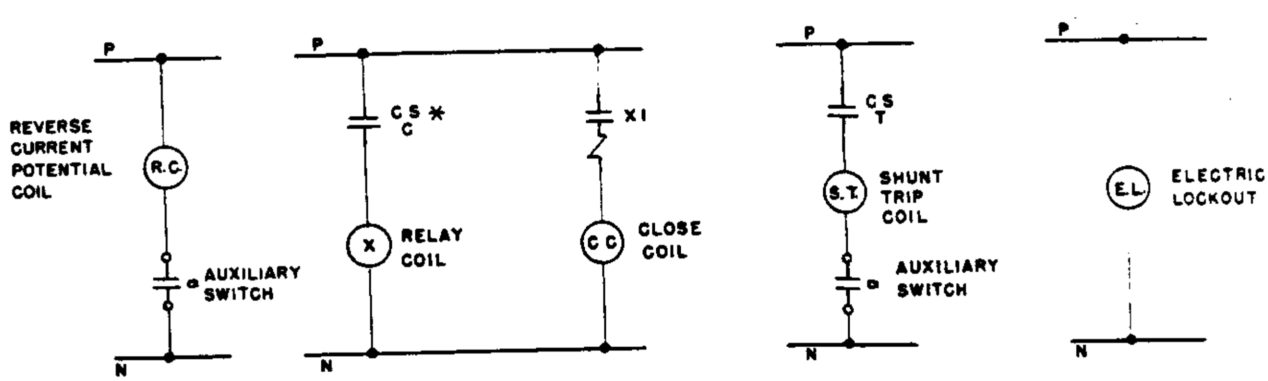


FIG. 3 — Wiring Diagrams

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SECTION D—COMPONENTS AND ATTACHMENTS

D-1. GENERAL ASSEMBLY (MANUALLY OPERATED BREAKER)

The DBN-40S air circuit breaker is provided with two series overcurrent trip devices. Both poles are identical, each being provided with a stationary and moving contact assembly and an arc chute.

A center base with a reverse current trip may be supplied and connected in series with the right hand pole unit.

D-2. GENERAL ASSEMBLY (ELECTRICALLY OPERATED CIRCUIT BREAKER)

The general assembly of the electrically operated breaker is similar to that of the manually operated breaker. The addition of a closing magnet and closing relay makes the breaker electrically operated. In addition to this, the anti-shock-close device is arranged to act on the moving core of the closing magnet rather than directly on the mechanism as in the case of manually operated breakers.

D-3. ARC CHUTES

Reference Figure 4

FUNCTION

The arc chute (135) mounted above and surrounding the contact assembly of each pole, has the function of stretching and cooling the arc drawn by the separating contacts so that it may be quickly extinguished and the circuit opened in the least possible time. The arc chutes are an extremely important part of the circuit breaker and the breaker should never be energized without their being mounted in place.

DESCRIPTION

Each arc chute consists of a number of metal plates (138) and (139) and asbestos plates (140) supported in a laminated case (135) and held in place by a clamping plate (136) and insulating tube spacers (146) and two screws (147) through the insulating spacers to the molded base (100). When the arc is drawn by the separating contacts, it moves up into the chute by magnetic and thermal action where it is quickly de-ionized and extinguished thus opening the circuit.

D-4. CONTACT ASSEMBLY

Reference Figure 4

FUNCTION

The contact assembly closes and opens the electric circuit through the circuit breaker. The upper stud (120), the stationary contact (121) the series overcurrent trip device (400) (when supplied) and the lower stud (105) are stationary and are mounted rigidly on the molded base (100). The moving contact assembly is hinged on the molded base by pin (127) and is moved in and out by molded insulating link (116) which is pivoted on cross bar (168) Figure 2.

The moving contact assembly is closed and held in the closed position against the force of the accelerating spring (131) by the insulating link (116). When the force exerted by the insulating link is released by tripping the breaker, the accelerating spring quickly moves the moving contact assembly to the open position. When the breaker interrupts high short circuit currents, magnetic forces play a large part in the rapid opening of the contacts.

With the circuit breaker in the closed position, main contact surfaces (109) and (121) are held together and carry the load current. When the circuit breaker is tripped, arcing contact surfaces (119) and (123) snap together an instant before main contact surfaces (109) and (121) separate and then the moving contact assembly moves away, drawing the arc between the arcing contacts. This arrangement minimizes arc damage to main current carrying contacts. When the circuit breaker is closed the arcing contact surfaces touch first and then separate as the main contacts touch and the closing operation is completed.

DESCRIPTION

The stationary contact assembly consists of the main contact extruded integral with the upper stud (120) and the arcing contact (123) fastened to the extruded copper section by two screws (124). Contact surfaces (121) and (123) are special arc-resisting silver alloy inserts.

The moving contact assembly consists of a contact base (110) of copper to which is fas-

	100	MOLDED BASE
	101	INSERT
	102	INSERT
	103	INSERT
	104	INSERT
	105	LOWER STUD
	106	CONTACT LINK
	107	ARMATURE
	108	SHUNT
	109	MAIN MOVING CONTACT TIP
	110	CONTACT BASE
	111	LINK
	112	¼-20 X ⅝ HEX. STL. BOLT
	113	LOCKING CLIP
	114	½-20 BRS. LOCKNUT
	115	PIN
	116	MOLDED LINK
	117	INSERT
*	118	CONTACT, MOVING ARCING
	119	MOVING ARCING CONTACT TIP
	120	UPPER STUD
	121	STATIONARY CONTACT TIP
	122	STATIONARY ARCING CONTACT TIP
*	123	CONTACT, STATIONARY ARCING
	124	.190-32 X ⅜ PAN STL. SEMS MACH SCR.
	125	BRACKET
	126	BRACKET
	127	PIN
	128	¼-20 X ½ FIL. STL. MACH. SCR.
	129	⅜-16 X 1⅛ HEX. SI. BRZ. BOLT
	130	PIN
*	131	SPRING, ACCELERATING
	132	BOLT
	133	CONNECTOR
	134	SOLDER
	135	ARC CHUTE
	136	CLAMPING PLATE
	137	SHIELD
	138	PLATE
	139	PLATE
	140	PLATE
	141	PLATE
	142	SPACER
	143	GUIDE
	144	PLATE
	145	CLAMPING PLATE
	146	TUBE SPACER
	147	¼-20 X 11 HEX STL. BOLT
	400	OVERCURRENT TRIP

*REPAIR PARTS

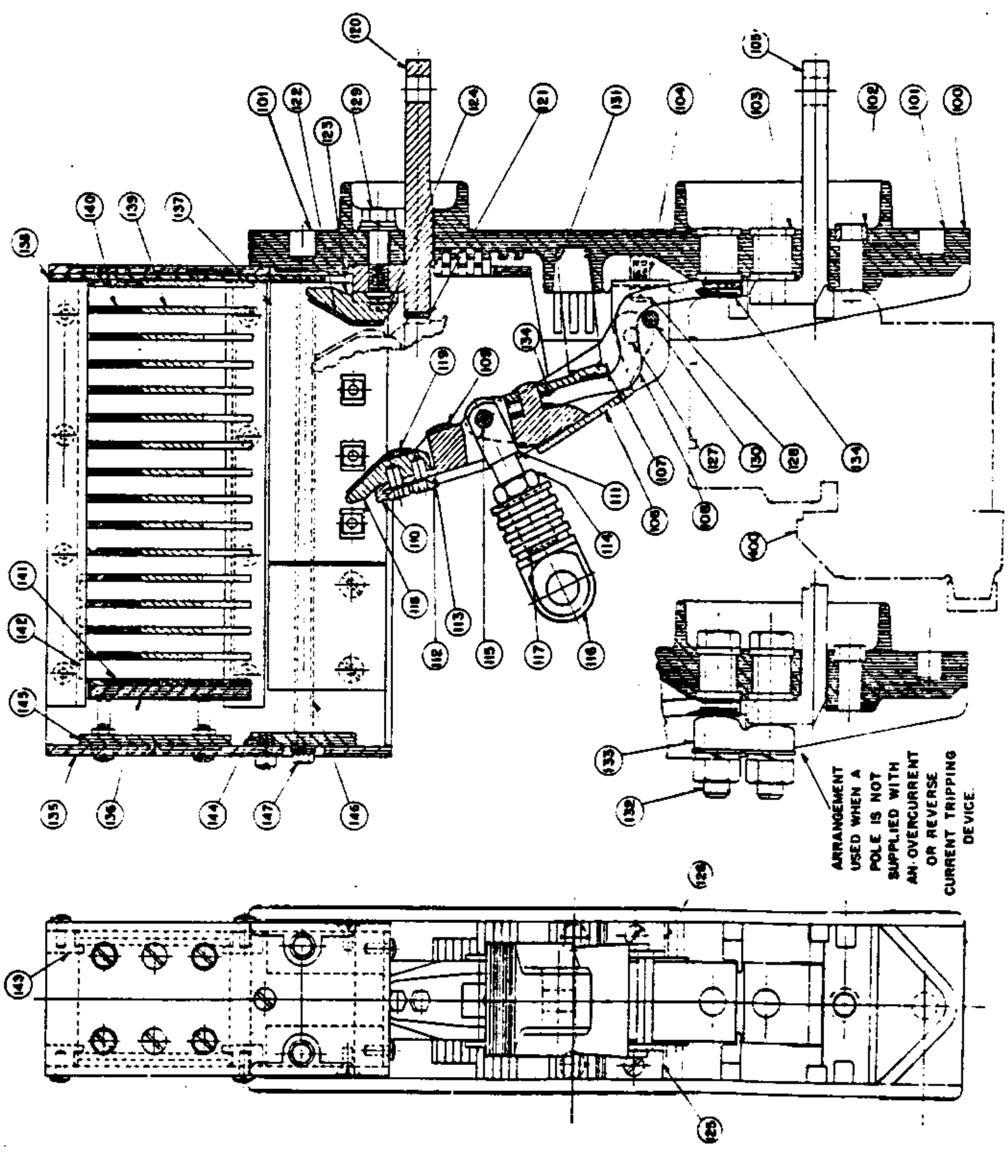
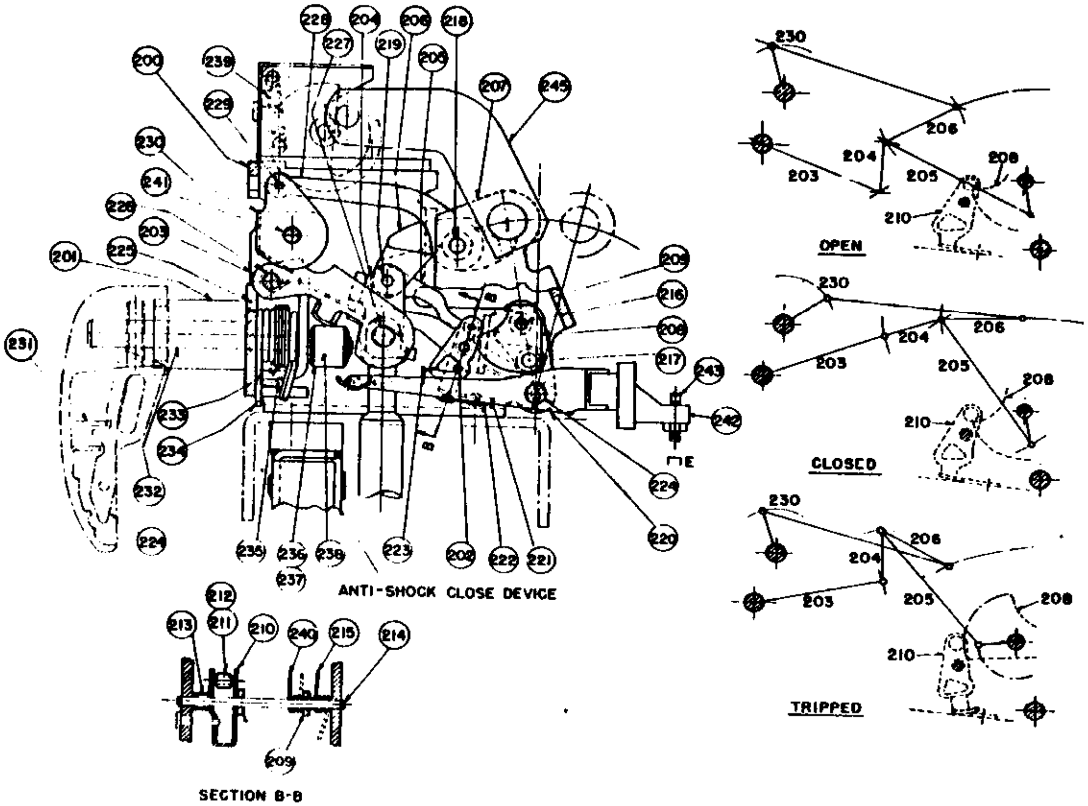


Fig. 4 — Arc Chute and Contact Assembly



	200	MECH. FRAME
	201	BEARING
	202	LATCH STUD PIN
	203	FIRST TOGGLE LINK
	204	SECOND TOGGLE LINK
	205	LINK
	206	THIRD TOGGLE LINK
	207	CLOSING LEVER
	208	LATCH
	209	PAWL
	210	ROLLER LATCH
	211	ROLLER
	212	PIN
	213	SPACER
	214	PIN
*	215	SPRING, L.H. PAWL
	216	PIN
	217	PIN
	218	PIN
	219	PIN
	220	TRIP LEVER
	221	TRIGGER
	222	SPRING PLATE STOP
*	223	SPRING, ROLLER LATCH
	224	LATCH, HANDLE
*	225	SPRING, RETRIEVE
	226	PIN
	227	PIN
	228	INDICATOR LINK
	229	PIN
	230	INDICATOR
	231	SPRING, HANDLE LATCH
	232	SHAFT
*	233	SPRING, HANDLE RETURN
*	234	SPRING, TRIP
	235	LEVER
	236	ROLLER
	237	NEEDLE BEARING
	238	PIN
*	239	SPRING, ANTI-BOUNCE RETURN
*	240	SPRING, R.H. PAWL
	241	PIN
	242	TRIP FINGER
	243	SCREW
	244	5/16-24 SET SCREW
	245	ANTI-BOUNCE LATCH

* REPAIR PARTS

Fig. 5 — Mechanism

p(ɔn by pawl (209) which latches under pin (22ı). The handle shaft and lever are returned to the normal position after closing by handle return spring (233).

The mechanism is opened by rotating trip lever (220) counterclockwise. This is accomplished either by rotating handle counterclockwise, in which case the handle shaft lever strikes the extreme left end of trip lever (220) to move it downward; or by forcing push rod "E" of the tripping attachments to strike trip finger screw (243). In either case the counterclockwise rotation of the trip lever (220) moves trigger (221) out of engagement with the lower end of the roller latch (210), which in turn permits the roller latch to rotate counterclockwise out of engagement with latch (208). Latch (208) is then free to rotate in response to the pull of the latch link (205) so that the mechanism assumes the trip free position shown in Figure 5 in which the contacts are open but part of the mechanism levers are in the closed position. In this position pawl (209) is disengaged from pin (227) by a lug on link (204) which pushes it up permitting the linkage to collapse to the ope⁻ ⁻osition shown in Figure 4.

⁻⁻rip spring (234) returns operating handle to(normal vertical position after manual trippıng.

ANTI-BOUNCE LATCH

The anti-bounce latch (245) prevents the closing lever (207) from bouncing off its stops and re-closing the circuit when the circuit breaker interrupts maximum short circuit currents. When the circuit breaker interrupts these high currents, the top of the closing lever knocks the latch up, causing the latch to engage the closing lever should it tend to return to the closed position. The latch is mounted on top of the mechanism frame.

POSITION INDICATOR

Position indicator (230) is formed from sheet metal and is pivoted on pin (241). It is visible from the front of the circuit breaker through a window in the faceplate and mechanism frame. See Figure 2. With the circuit breaker in the open position shown in Figure 5, the yellow face of the indicator shows through the window. The word "OPEN" is stamped on this yellow face. When the breaker closes, pin (21 ɔf the closing lever (207) pulls indicator link ²28) to the right, thus rotating the other fa(the indicator up into a position visible thrꝺugn the window. This face is painted blue and is stamped with the word "CLOSED".

REPLACEMENTS

To replace roller latch spring (223):

(a) Prepare to remove mechanism by removing anti-shock-open device (250), terminal block (169) and auxiliary switch (550) all of Figure 2. Avoid removing any more wires than necessary. It will usually be possible to push the devices aside without removing the wiring. Tag any wires which may have to be removed.

(b) Rotate handle (166) clockwise until pin (277) is visible through a hole in the right side of the mechanism frame. Using a small rod as a pusher, shove this pin part way through the hole until the rod of the anti-shock-close device, in the case of manually operated circuit breakers, or the operating rod of the closing magnet, in the case of electrically operated circuit breakers drops off. Return the pin (227) to its proper location and allow linkages to fall open. This frees mechanism from anti-shock-close device or the closing magnet as the case may be.

(c) Remove handle (166), faceplate (155) and cross' bar (168) of Figure 2.

(d) Remove the four bolts which hold mechanism to the shelf (152) Figure 2. This frees mechanism from shelf but frees also either anti-shock-close device (360) of manually operated breakers or closing magnet (340) of electrically operated breakers.

These devices should be temporarily replaced while repairs are being made to the mechanism.

(e) Removal of pin (224) enables trip lever (220) to be removed and spring (223) may then be replaced.

To replace pawl springs (215) and (240):

(a) Repeat (a) to (e) above.

(b) Remove pin (214) far enough to release pawl (209). Roller latch (210) and hold-in which are pivoted on the same pin will then remain in place. Replace springs (215) and (240), making sure that their ends are supported correctly as indicated in Figure 5.

To replace trip spring (234) or handle return spring (233):

(a) Repeat operations (a) through (e) under replacement of roller latch spring.

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(b) Remove pin (214) and drop pawl (209) and roller latch (210) out of frame.

(c) Remove snap ring from handle shaft (232) and push the handle shaft back into frame. Spring (233) or (234) may then be replaced.

To replace retrieve spring (225):

(a) Repeat operations (a) through (e) under "Replacement of Roller Latch Spring".

(b) Remove cover (239).

(c) Remove pins (241) and (226). Retrieve spring (225) may then be replaced.

When replacing mechanism springs, particular attention should be given to the mechanism drawing Figure 5 to see that spring ends are properly placed and that torsion springs are properly oriented to exert torque in the proper direction.

D-6. ANTI-SHOCK-CLOSE DEVICE

Reference Figure 6

FUNCTION

This device serves to prevent the circuit breaker contacts from closing from shock when open. This is accomplished by an arrangement whereby a mechanical escapement device or "ticker" is operated by the closing of the breaker. Shock blows tending to close the breaker are of such short duration that the mechanical escapement device does not have time to operate and the device effectively locks the open circuit breaker in the open position under shock conditions.

DESCRIPTION

The anti-shock-close device consists of a ticker case (360) Figure 6 which contains the ticker assembly, bolted to the platform by two bolts (379). A rod and cam pusher assembly (363) is connected at its upper end to pin (227) Fig. 5 of the mechanism. Whenever circuit breaker is closed, rod (363) is pulled up by pin (227) and cam (361) is caused to rotate in a clockwise direction around pin (370) against the torsion of return spring (369). As the cam rotates in this manner, oscillator wheel (362) is caused to rotate clockwise around pin (372) by pin (369) mounted in cam (361). The rotation of wheel (362) is regulated by mechanical oscillator (364) which is pivoted on pin (365). This oscillator oscillates due to the engagement of its teeth with the teeth of oscillator wheel (362). When the circuit breaker is tripped, rod (363) drops unimpeded and return spring (369) returns cam and consequently oscillator wheel to the "breaker open" position shown in the figure.

Shock blows tending to close the circuit breaker would have to act in such a way as to raise rod (363). These blows are of such short duration that the cam is restrained long enough by the oscillator wheel and oscillator to prevent closing of the circuit breaker.

REPLACEMENTS

To replace return spring (369):

(a) Remove handle (166) and faceplate (155) Figure 2.

(b) Remove guide pieces (374) and (375) by removing bolt (376).

(c) Remove bolts (379) and remove case (360) from shelf.

(d) Removing snap rings (367), (371) and (373) will allow corresponding pins to be removed. The various parts are then free to be removed and the spring may be replaced.

(e) After reassembly, be sure that the cam operates freely and that it returns freely to its starting position when pushed over.

D-7. ELECTRIC LOCKOUT

Reference Figure 7

FUNCTION

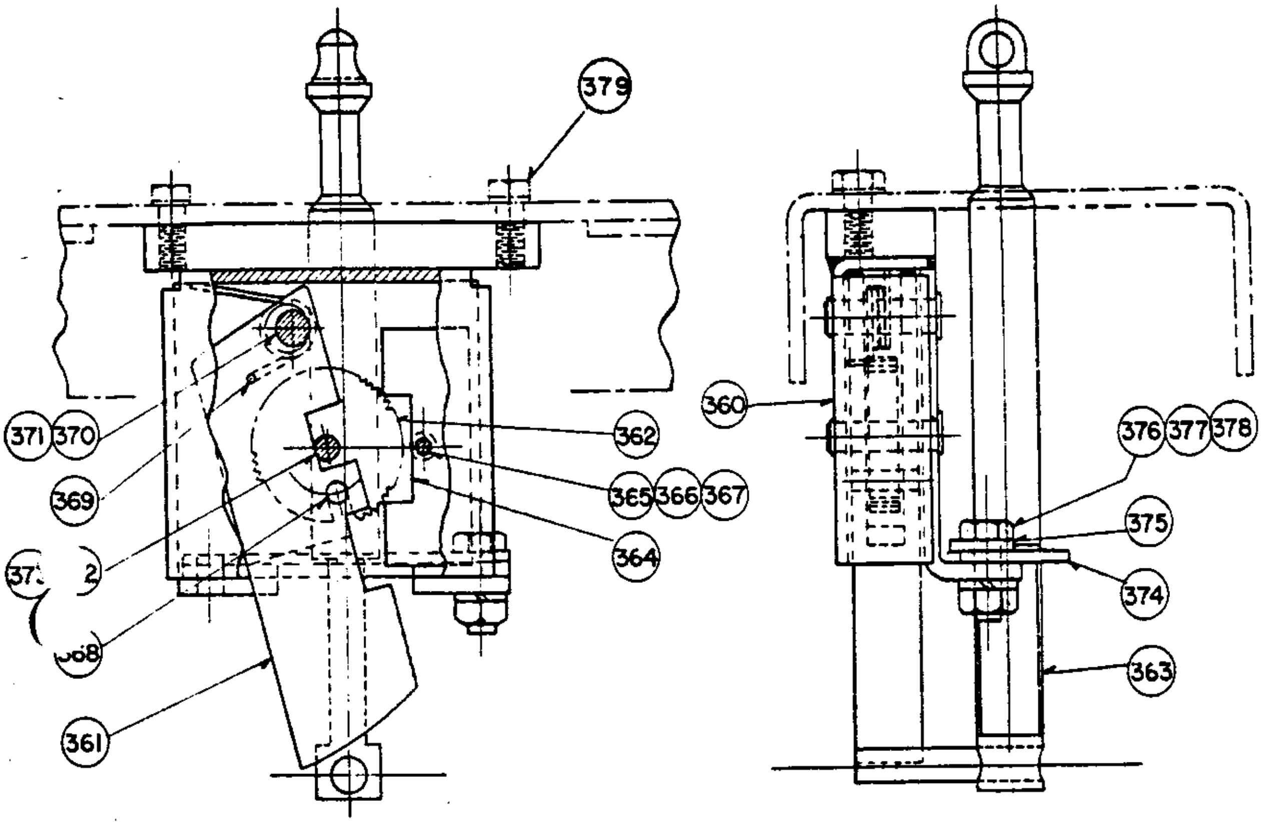
This device will prevent the circuit breaker from being closed unless its coil (711) is energized. It does this by holding up the trip bar and thus holding the circuit breaker in the "trip free" position.

DESCRIPTION

The device is bolted to the underside of the circuit breaker platform under the shunt trip device.

It consists of a coil (711), a stationary core (708), a moving core (709), a frame (701), and a system of linkages to the trip bar and cross bar.

When coil (711) is de-energized, moving core (709) drops down and lever (703) rotates



360	CASE
361	CAM
362	WHEEL
363	ROD AND CAM PUSHER
364	OSCILLATOR
365	PIN
366	.190 STD. BRS. WASHER
367	SNAP RING
368	PIN
* 369	SPRING, RESET

*REPAIR PARTS

370	PIN
371	SNAP RING
372	PIN
373	SNAP RING
374	GUIDE
375	GUIDE
376	5/16-18 X 7/8 HEX. STL. BOLT
377	5/16-18 HEX. MACH. SCR. NUT
378	5/16 STL. LOCKWASHER
379	BOLT

Fig. 6 — Anti-Shock-Close Device

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counterclockwise around pin (705) in response to pull of operating spring (704). This counterclockwise rotation of lever (703) pulls up locking lever (702) through pin (706) which in turn lifts trip bar (157).

When coil (711) is energized, moving core (709) moves up in response to the magnetic attraction between it and stationary core (708) pushing with it plunger rod (710) which turns lever (703) clockwise against the tension of spring (704). This rotation allows locking lever to drop and allows trip bar to reset.

When the circuit breaker is closed, cross bar link (715) is moved by the cross bar to such a position that the electric lockout is inoperative. In other words, with the breaker closed locking lever (702) is held down regardless of whether or not the coil (711) is energized.

REPLACEMENTS

Coil (711) or spring (704) may be easily replaced after removing the device from the circuit breaker platform.

D-8. CLOSING MAGNET (ELECTRICALLY OPERATED CIRCUIT BREAKER)

Reference Figure 8

FUNCTION

The closing magnet is the device used to close the circuit breaker electrically and is mounted directly below the mechanism and under the shelf of the circuit breaker. It is secured to the shelf with the same four bolts that hold the mechanism in place.

Together with a control switch, a source of power, and the closing relay, the closing magnet enables an operator to close the circuit breaker from a remote point.

DESCRIPTION

The closing magnet Figure 8 consists of an iron frame or yoke which is securely bolted to the circuit breaker shelf, a plunger or moving core (348), an operating rod (346), a stationary core (355), and a coil (350).

The operating rod (346) connects the moving core (348) to pin (227) Figure 5 of the mechanism. It will be observed that an upward movement of this pin will cause the mechanism to close and latch the circuit breaker.

When coil (350) is energized by contact of relay (see Figure 3) the moving core (348) moves upward in response to the magnetic attraction between stationary and moving cores across air gap "A". About one-tenth of a second is required for the solenoid to close and latch the circuit breaker. When the moving core moves into the "breaker closed" or "closed gap" position, trip bracket (353) trips the relay mechanically, and its contacts open, thus de-energizing the closing magnet. The closing coil is momentarily rated and serious damage will result if potential is allowed to remain on its terminals through improper adjustment of trip stud (327) of the relay Figure 9 so that the relay does not trip and interrupt close coil circuits. When the moving core and operating arm have pushed the mechanism linkages to the closed and latched position, pin (227) holds the moving core in the "closed gap position".

When the mechanism is tripped pin (227) falls allowing operating arm and moving core to fall with it.

REPLACEMENTS

To replace closing coil (350):

(a) Remove handle (166) and faceplate (155) Figure 2.

(b) Remove trip bracket (353) and cam pusher by removing bolts (352).

(c) Remove anti-shock-close device from side of closing magnet by removing bolt (354) and bolts (345). This frees punchings (344).

(d) Disconnect closing coil leads from terminal of terminal block and terminal of closing relay.

(e) Coil may then be worked out of yoke and replaced.

ANTI-SHOCK-CLOSE DEVICE

On electrically operated circuit breakers, the anti-shock-close device (354) is bolted to the side of the closing magnet. Arm (374) bolted to the bottom of moving core (348) operates cam (361) of the device. Otherwise the operation is identical with that described in Section D-6.

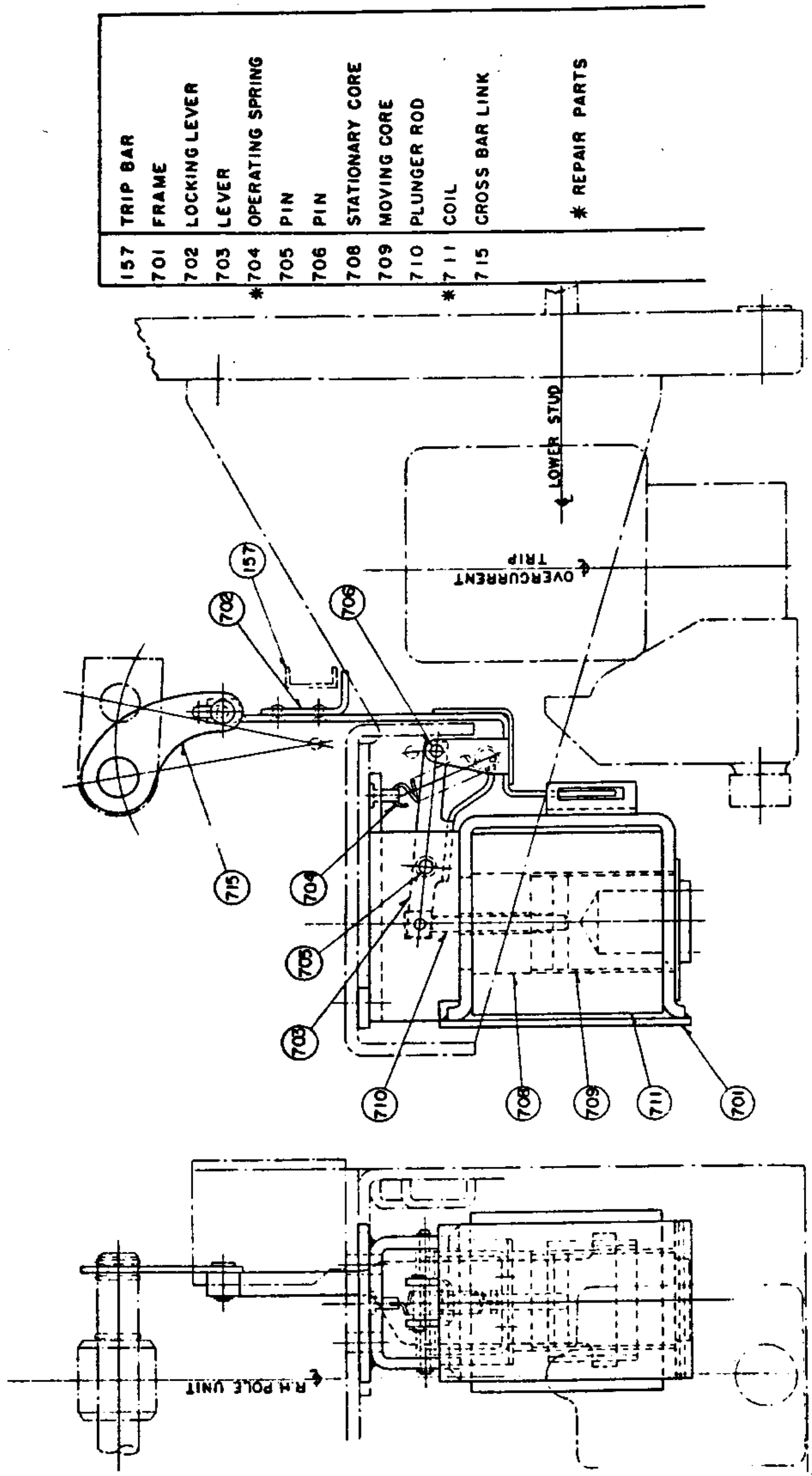

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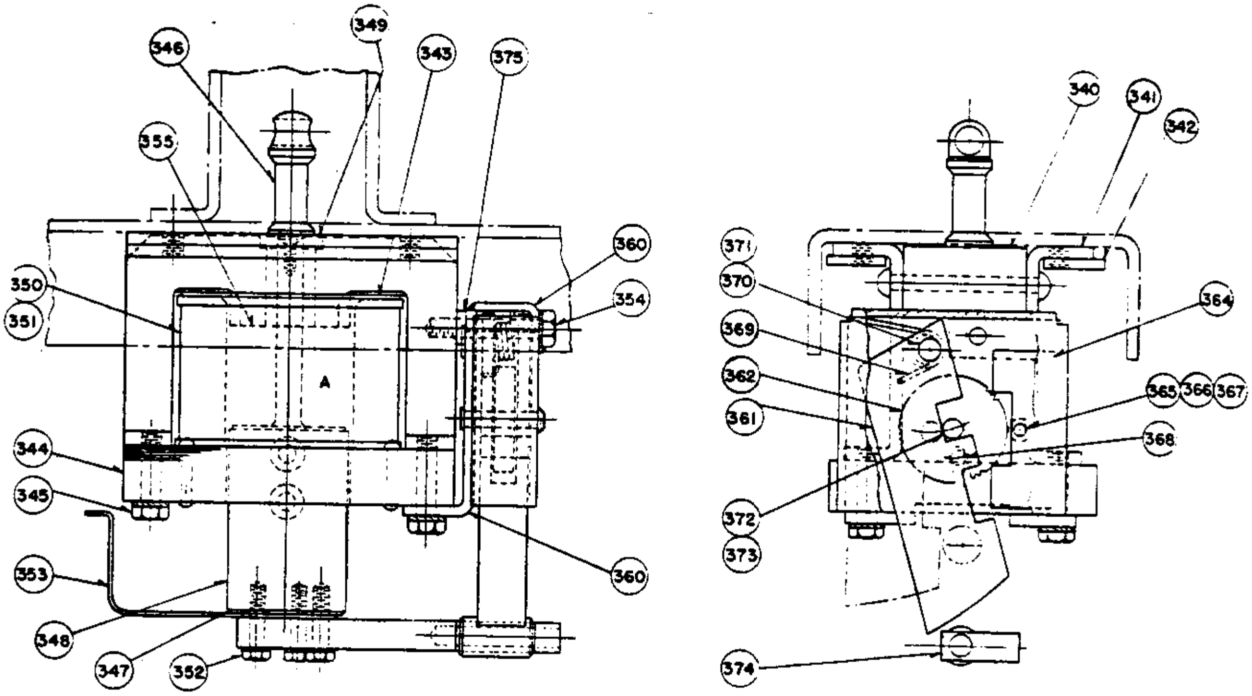
Fig. 7 — Electric Lockout Device



340	CLOSING MAGNET
341	SIDE PLATE
342	PAD
343	PACKING WASHER
344	PUNCHINGS
345	BOLT
346	ROD
347	PUNCHINGS
348	MOVING CORE
349	STOP
* 350	COIL
351	SPOOL
352	BOLT
353	TRIP BRACKET
354	BOLT
355	STATIONARY CORE

360	ANTI-SHOCK-CLOSE DEVICE
361	CAM
362	WHEEL
364	OSCILLATOR
365	PIN
366	.190 STD. BRS WASHER
367	SNAP RING
368	PIN
* 369	SPRING
370	PIN
371	SNAP RING
372	PIN
373	SNAP RING
374	ARM
375	PAD

Fig. 8 — Closing Magnet

D- THE CLOSING COIL CONTACTOR (ELECTRICALLY OPERATED CIRCUIT BREAKER)

Reference Figure 9

FUNCTION

The closing relay is used on electrically operated circuit breakers only and is mounted on the underside of the breaker shelf to the left of the closing magnet. The relay has the function of closing and opening the closing coil circuit in electrical operation. Together with the shunt trip, the relay enables the operator to control the circuit breaker electrically from a remote point by means of control switches. The operating coil of the DBN-40S closing relay has a momentary rating.

DETAILED DESCRIPTION

The relay base (300) is molded from insulating material. Contact assemblies, coil assembly, and other parts are attached to the base. Frame (305) serves as part of the magnetic circuit of coil (338) and also serves to hold the coil in place. This frame or yoke is fastened to the molded base by three screws (31 . The coil (338) is wound on a molded spool (339) and is held in place by guide tube (337) which extends from the top of the molded base through the bottom of the frame (305) and through the center of the spool.

The moving core (333) is free to slide up and down in the guide tube (337). In moving up in response to the magnetic pull from the stationary core when the coil is energized by closing switch CSC, Figure 3, the moving core pulls up latch (336) which is fastened with pin (335). When the coil (338) is energized, spring (334) bearing against latch (336) holds latch in such a position that it is hooked under latch pin (316) thus causing moving contact arm assembly (301) to rotate counterclockwise around contact arm pin (329), thereby compressing spring (314). The moving contact (303) is thus pulled against the stationary contact (304) completing the circuit. In Figure 9 the moving core is shown in the upper or "contacts closed" position.

As soon as the contacts close, current starts flowing through the closing coil of the circuit breaker. The moving core (348) of the closing magnet, Figure 8, moves up, closing the circuit breaker. Trip bracket (353) fastened to moving core moves up with it and strikes trip stud (327) of the relay. The trip screw is fastened to release bracket (308) which is caused to rotate counterclockwise around pin (317) against the torque exerted by torsion spring (313). When release bracket (308) is rotated in this manner, it strikes the bottom of latch (336) rotating it counterclockwise around pin (335) against the force of spring (334). This rotation of latch (336) causes it to become disengaged from latch pin (316) and consequently spring (314) extends causing moving contact assembly (301) to rotate clockwise thereby snapping moving contacts (303) away from stationary contacts (304) and interrupting the circuits.

The moving contact (303) is resiliently mounted by means of spring (312) around stud set into the moving contact arm (301) and is secured by elastic stop nut (315). This causes a slight rolling and wiping action on the spherically shaped contact surfaces as they meet which helps to insure a positive electrical connection.

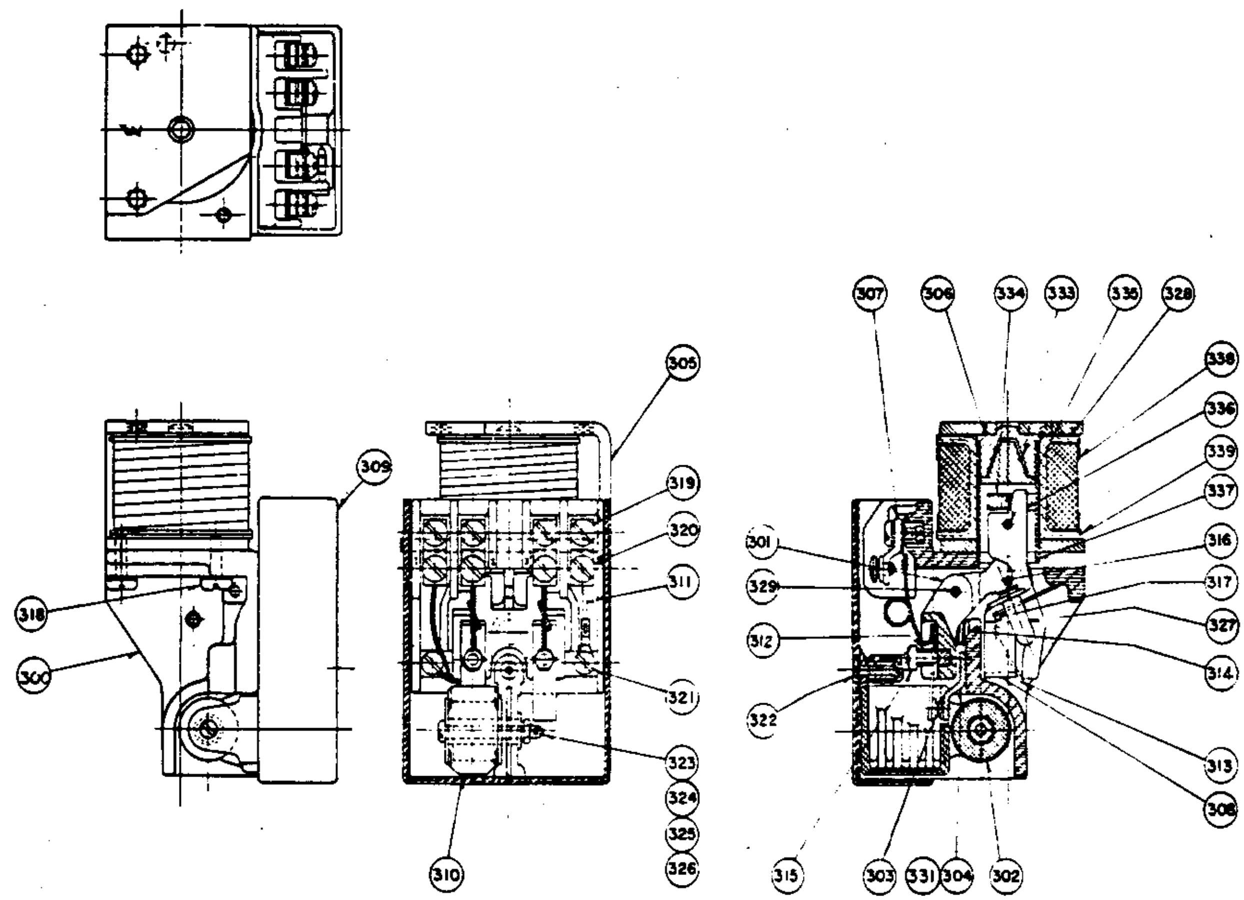
An arc chamber (310) molded from arc resisting material surrounds the left hand contacts. It is held in place by means of the two iron plates of the blowout magnet assembly (310) which in turn is fastened to the molded base (300) by means of screw (323). The blowout magnet coil is connected in series with the contacts and consequently flux is flowing through the magnetic circuit and the air gap of the blowout magnet assembly at the time the contacts part and draw an arc. The magnetic circuit is so arranged that its air gap is across the arc chamber and the arc. The arc is forced by magnetic action down into the arc chamber where it goes out due to the stretching and cooling process. The right hand contact is not used.

ADJUSTMENT

The relay trip out sequence should be checked as follows:

(a) Remove cover (309) from relay and disconnect closing coil lead from relay.

(b) Energize relay coil (momentary rated coil may be safely energized for 3 or 4 minutes). Close breaker slowly manually and observe relative position of cross bar (168) Figure 2 when trip bracket (353) Figure 8 releases relay contacts. The release position should occur just before the breaker latches closed; but within the last 1/64 inch travel of the cross bar. Bend trip bracket (353) if required to obtain above adjustment. With breaker closed, relay coil should be de-energized and energized several times to make sure relay contacts will not close.



300	RELAY BASE	321	164-32X3/8 PAN HD.SCR.
301	MOVING CONT. ARM ASSY.	322	164-32X3/4 PAN HD.SCR.
*302	BLOWOUT MAGNET ASSY.	323	.190-32X1 3/8 PAN HD.SCR.
*303	MOVING CONT. ASSY.	324	.190 STD. WASHER
*304	STAT. CONT. ASSY. R.H.	325	.190 STD. LOCKWASHER
305	FRAME	326	.190-32 NUT
306	STAT. CORE	327	TRIP STUD
307	TERMINAL BRACKET	328	SPRING WASHER
308	RELEASE BRACKET	329	CONTACT ARM PIN
309	COVER		
310	ARC CHAMBER	*331	STAT. CONT. ASSY. L.H.
311	TERM. CONN.		
*312	SPRING, CONTACT	333	MOVING CORE
*313	SPRING, TRIP	*334	SPRING, LATCH
*314	SPRING, CONTACT ARM	335	PIN
315	ELASTIC STOP NUT	336	LATCH
316	LATCH PIN	337	GUIDE TUBE
317	RELEASE BRKT PIN	*338	OPERATING COIL
318	1/4-20X5/8 SCREW	339	MOLDED SPOOL
319	.190-32X3/8 SCREW		
320	.190X1/4 BINDING HD.SCR.		
			* REPAIR PARTS

Fig. 9 — Closing Relay

(d) Reconnect close coil and close breaker electrically. With breaker closed, relay coil should be de-energized and energized several times to make sure the relay contacts will make.

REPLACEMENT OF SPARE PARTS

DANGER!

Before working on the relay, make sure that the circuit breaker is open and that the upper and lower studs are "dead". Make sure that control circuits are "dead". Realize that contorl wiring may be "hot" even though the main circuit breaker studs are "dead".

Before replacing parts of the relay, it is best to disconnect the wiring and remove it from the circuit breaker:

(a) Remove screw (322) and lift off molded cover (309) of the relay thus exposing the terminals.

(b) Remove and tag the wires from the terminals by loosening screws (320).

(c) One or more lead from the relay coil may be connected to the terminal block. Remove front cover of the terminal block and disconnect leads.

(d) Remove the two screws through the circuit breaker shelf (152) Figure 2 which hold the relay to the shelf.

The relay is now free from the circuit breaker.

To replace relay coil:

(a) Remove three screws holding coil frame (305) to molded base (300) and remove from base.

(b) Pull out guide tube (337) allowing stationary core to drop out. Coil is now free to be replaced.

To replace latch spring (334):

(a) Remove frame (305) as before.

(b) Lift out moving core assembly (333).

(c) Rotate latch clockwise as far as it will go.

(,ring will drop out. Replace.

To replace trip spring (313):

(a) Remove release bracket pin (317).

(b) Replace pin and new spring.

To replace moving contact arm assembly spring (314):

(a) Remove contact arm pin.

(b) This releases moving contact arm assembly (303) and spring (314) may then be replaced.

To replace moving contact (303) or contact spring (312):

(a) Remove elastic stop nut (315) and replace spring (if necessary).

(b) If the moving contact is to be replaced, disconnect its lead from under the terminal screw (319) and remove and replace.

To replace blowout magnet assembly:

(a) Remove leads of blowout coil.

(b) Remove screw (323) and replace blowout magnet assembly.

To replace stationary contact assembly:

(a) Remove blowout magnet assembly as outlined above.

(b) Remove the screw (321) and replace contact.

D-10. ANTI-SHOCK-OPEN DEVICE

Reference Figure 10

FUNCTION

This device prevents tripping of the circuit breaker due to rotation of the trip lever caused by shock but allows normal rotation of the trip lever by tripping devices.

DESCRIPTION

The bracket (250) is mounted on the supporting frame shelf to the immediate right of the operating mechanism frame (200) Figure 1 and is held to the shelf by two bolts (256). Lever (252) is pivoted on pin (253) as is plate (254). Lever and plate are connected by bolt and elastic stop nut (265) in such a way that if the trip bar raises, lever (252) rotates counterclockwise around pin (253) and plate (254) is caused to rotate in the same direction. Con-

35-224.C5

versely, if plate (254) is restrained from rotating, trip bar is held down by lever (252). Under shock conditions, plate (254) is restrained from moving in the following manner:

Studs (255) and (258) are suspended on pin (251) and plate (254) is fitted with a slot in its end arranged so that the plate will slide down and allow the circuit breaker to trip under normal tripping impulses. Under shock conditions, however, the two outboard studs are caused to rotate around pin (251) due to the off center weights (257), thus jamming the plate (254) from sliding down. The middle stud is actuated by a separately pivoted weight (267) which rotates about pin (264). Spring (262) serves to hold weight in position shown during normal operation.

REPLACEMENTS

To replace plate spring (263):

(a) Remove cover by removing screws (266).

(b) Remove device from shelf by removing two screws (256).

(c) Remove right hand snap ring from pin (253) and withdraw pin (253) far enough to free spring (263).

ADJUSTMENT

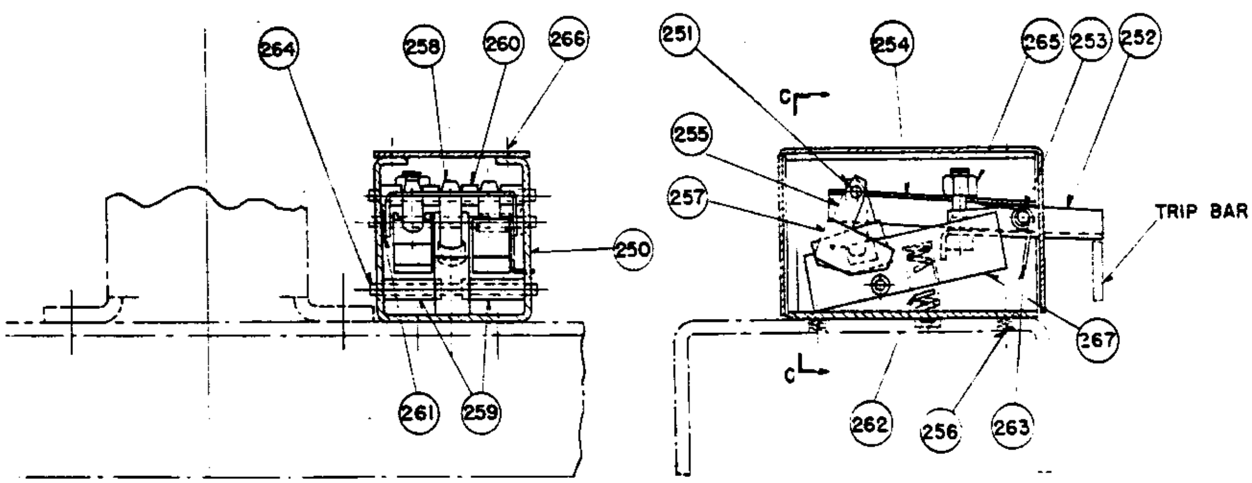
With the breaker closed any motion of trip bar (157) should cause plate (254) to move down. Pushing trip bar down about 1/16 inch should cause 1/32 inch or less upward motion of slotted end of plate (254). Adjustment should be made with breaker open by turning nut (265).

D-11. SERIES OVERCURRENT TRIP DEVICE

Reference Figure 11

FUNCTION

This device provides for selective protection of the various portions of the electrical system under two distinct conditions of current: First, for low overcurrent values, it will trip the breaker after a SHORT TIME DELAY; and second, for still higher values of overcurrent it will trip the circuit breaker instantaneously.



SECTION C-C

250	ANTI-SHOCK OPEN BRACKET	259	SPACER
251	PIN	260	SPACER
252	LEVER	261	WASHER
253	PIN	*262	SPRING WEIGHT
254	PLATE	*263	SPRING PLATE
255	STUD	264	PIN
256	SCREW	265	1/4-20 ELASTIC STOP NUT
257	WEIGHT	266	J64-32 X 1/4 FIL. HD. STL. MACH. SCR.
258	STUD	267	WEIGHT

Fig. 10 — Anti-Shock-Open Device

D(IPTION

The device is actuated by an electromagnet connected in series with the moving contact assembly and the lower stud of the circuit breaker.

The SHORT TIME DELAY pickup calibration is set at the factory at the ampere setting marked on the nameplate. The operating time consists of three different time settings: minimum, intermediate and maximum time. If an overcurrent occurs of greater magnitude than the short time delay pickup setting, the circuit brea'-er will trip subject to a short time delay as determined by a gear escapement mechanism.

At currents above the instantaneous setting, the circuit breaker trips without any intentional time delay. The pickup setting is made at the factory at some ampere value from 5 to 30 times the series overcurrent trip coil rating and is not readily adjustable in the field. The maximum setting shall not exceed 18,000 amperes.

If during the short time delay period the current drops to 100% of rated overcurrent trip coil current, the series overcurrent trip device wil set and the breaker will not trip provided the ercurrent has not persisted beyond the ti(dicated by the lower edge of the band cur. for the particular breaker involved.

SHORT TIME DELAY

The tube (423) consists of an upper non-magnetic tube and a lower core (424) of magnetic material.

With an overcurrent in excess of pickup, the magnetic force between lower core (424), and yoke ring (475) will cause the tube to rise and trip the breaker restrained only by the mecha..cal escapement device.

The pin (472) in lower core is attached to a mechanical escapement device enclosed in housing (458). This device consists of a lever (459) pivoted on a fixed pin (463) and connected through instantaneous spring (420) to gear segment (460) which operates pinion (474) and oscillator wheel (461) which is on the same shaft. Oscillator wheel (461) is impeded from free rotation by oscillator (462).

INST TANEOUS TRIP

(fault currents of sufficient magnitude o ex..d instantaneous spring (420), the operation is identical with the above except that the upward motion of the tube is not restrained by oscillator (462) due to the extension of instantaneous spring (420).

REPLACEMENTS

To replace calibration springs (410):

(a) Remove two bolts (451) and (478) from back of panel and remove trip device.

(b) Remove insulation cover (484) by removing screws (495). Calibration springs (410) are now accessible for replacement.

To replace instantaneous spring (420):

(a) Repeat (a) and (b) above.

(b) Remove housing (458) from yoke (457) by removing four screws (476).

(c) Spring (420) may be replaced by loosening adjusting screw (469). Arm (456) must be pin pricked near the screw after replacement for locking purposes.

D-12. AUXILIARY SWITCH

Reference Figure 12

FUNCTION

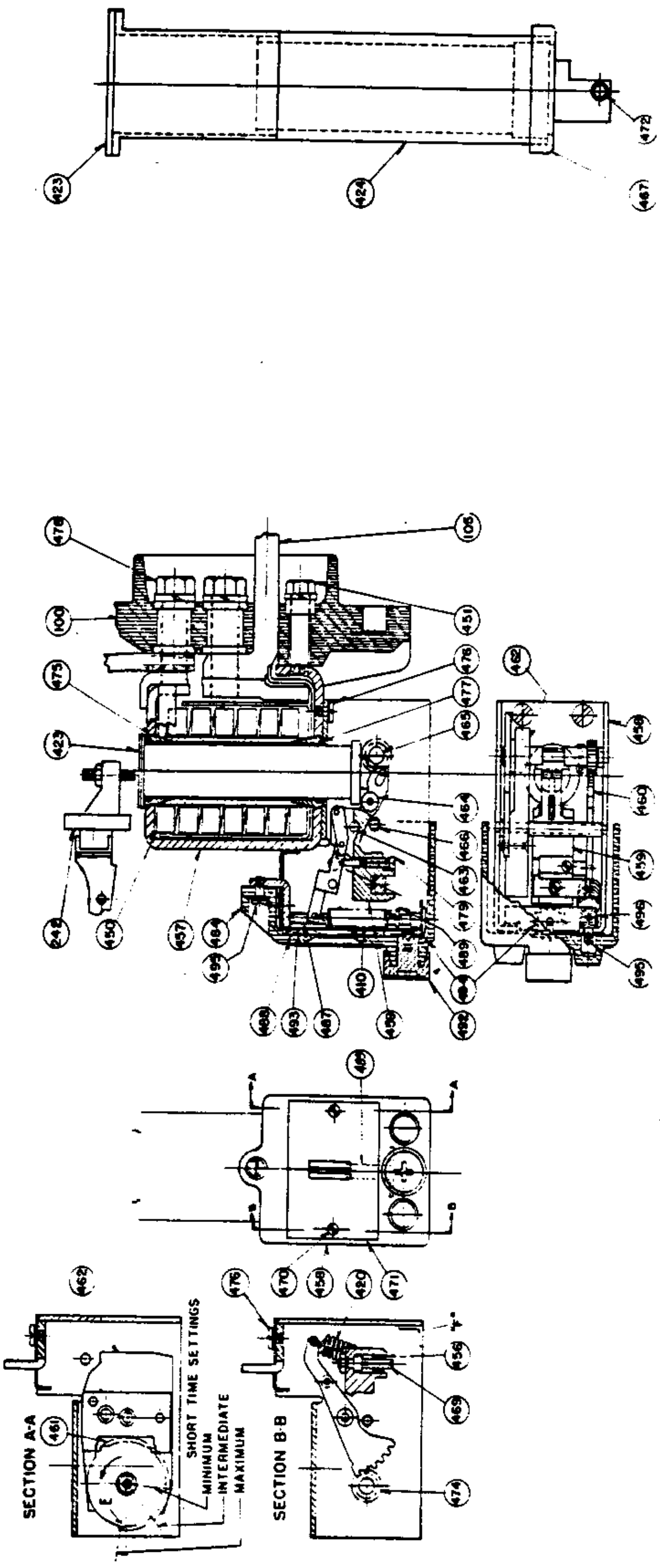
The auxiliary switch is used to close or open auxiliary or control circuits. The closed or open positions of its sets of contacts are coordinated with the closed or open position of the main circuit breaker contacts.

DESCRIPTION

The four pole type RC auxiliary switch is mounted on the top of the supporting frame shelf to the left of the operating mechanism. It is operated by shaft (555) and arm (557) which connects to the breaker lever of the operating mechanism. An eight pole auxiliary switch consists of two four pole switches, one mounted above the other.

The contacts are designed to carry 15 amperes continuously or 250 amperes for three seconds.

The auxiliary switch is a shaft-operated, four pole, rotary type having "a" and "b" contacts. An "a" contact is one that is open when the circuit breaker is open, and a "b" contact is one that is closed when the circuit breaker is open.



100	BASE	464	ROLLER	492	ADJUSTING KNOB
105	STUD	465	PIN	493	SCALE PLATE
242	TRIP FINGER	466	PIN	494	STAR GEAR
*410	SPRING, CALIBRATION	467	END RING	495	SCREW
*420	SPRING, INSTANTANEOUS	469	ADJUSTING SCREW	496	BRACKET BOTTOM
423	TUBE ASSY.	470	12-40 X 1/4 T.C. SCR	423	TUBE
450	COIL, CURRENT	471	NAME PLATE	424	LOWER CORE
451	3/8-16 X 1-1/2 S. BOLT	472	PIN		
456	ARM	474	PINION		
457	YOKE	475	UPPER YOKE RING		
458	HOUSING	476	190-32 X 3/8 PAN HD S.M.SC		
459	TOGGLE & LEVER ASSY.	477	LOWER YOKE RING		
460	GEAR SEGMENT	478	1/2-13 X 1-7/8 S. BOLT		
461	OSCILLATOR WHEEL	479	SCREW		
462	OSCILLATOR	484	MOLDED COVER		
463	PIN	487	CALIBRATION SCREW		
		488	TRANSPARENT COVER		
		489	INDICATOR		

*REPAIR PARTS

Fig. 11 — Series Overcurrent Trip Device

C square shaft (555) extends through the ro... molds (560) which in turn insulate and support the rotor contacts (562). The rotor assembly is clamped together into a solid unit by screw (564). The rotor contacts are set 60° apart for 60° rotation of shaft (555).

Contact fingers (553) have one end hooked into stem (551) with spring (552) maintaining pressure between the finger contact and stem. The center of the contact finger bears against a stop surface in casing (550) to position the outer end of the contact finger.

REPLACEMENT OF AUXILIARY SWITCH

(a) Remove and tag the terminal connections.

(b) Disconnect arm (557) from closing lever, remove the two mounting bolts and remove switch.

(c) Remove link from closing lever and add new switch.

D-13. SHUNT TRIP DEVICE

Ref nce Figure 13

FU ION

The shunt trip device serves as a means of tripping the circuit breaker from some remote point by the closing of a control switch or relay contacts at that remote point.

DESCRIPTION

The shunt trip device is mounted on the extreme right end of the supporting frame shelf. It consists of a frame, coil and moving core mounted horizontally. Energizing trip coil (513) causes a magnetic attraction between stationary core (503) and moving core (504) which causes moving core (504) to move to the left rotating trip lever (501) about pin (502). Lever (501) raises trip bar (157) Fig. 1 to trip the circuit breaker. The opening of the circuit breaker de-energizes the shunt trip coil through an "a" contact of the auxiliary switch. See Section D-12. Spring (508) returns moving core (504) to its normal position. Non-magnetic washer (510) prevents residual magnetism from holding the cores together when the coil is de-energized.

REPLACEMENTS

replace coil (513):

(a) ..sconnect the shunt trip leads from the auxiliary switch and cut-off switch.

(b) Take out the two bolts (515) and remove the shunt trip assembly from the supporting frame.

(c) Remove pin (502) and screws (509) holding plate (505) in place and drop out the moving core (504), stationary core (503) and sleeve (507). The coil is then free to be replaced.

To replace spring (508):

(a) Repeat operations (a) and (b) above.

(b) Remove pin (502) and replace spring (508).

D-14. REVERSE CURRENT TRIP DEVICE (DIESEL GENERATOR BREAKER)

Reference Figure 14

FUNCTION

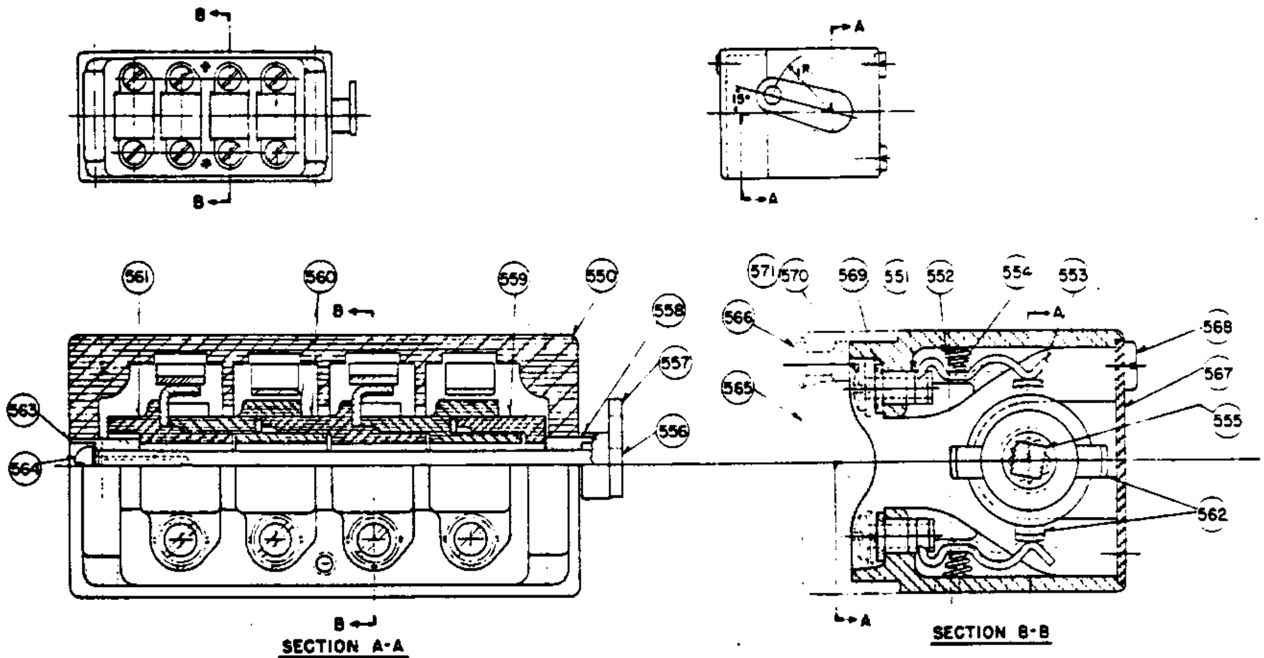
This device has application on direct current breakers only. It will instantaneously trip the circuit breaker when the current flows in its series coil in the reverse direction and exceeds the calibration setting. This device is set and marked in amperes, at the factory, at 120 amperes.

DESCRIPTION

This device is mounted on the center insulating base of the breaker and the top terminal of its current coil is connected to the upper stud of the circuit breaker. A copper connector (634) connects this upper stud to the lower stud of the right hand pole. Thus the series coil (624) of the reverse current trip device is connected in series with the right hand pole of the circuit breaker.

The potential coil (623) is connected directly across the line through an "a" contact of the auxiliary switch as shown in Figure 2. This contact demagnetizes the armature (603) when the breaker trips and permits calibration spring (612) to reset it.

The main structural parts of the device consist of a yoke (600), a pole piece (601), a core (610) and an armature (603), all of magnetic steel. Bearing casting (602) of non-magnetic material is drilled for pin (621) about which armature (603) has a limited freedom of rotation. If armature (603) rotates counterclockwise, it pulls pin (619) and link (606) with it. After link (606) has traveled some distance, the slot in its end engages pin (622) of trip lever (605) and moves it to the left. This causes trip lever



* 550	AUXILIARY SWITCH
551	STEM
552	CONTACT SPRING
553	CONTACT FINGER
554	RIVET
555	SHAFT
556	SHAFT END
557	ARM
558	SPACER
559	ROTOR END
560	ROTOR SECTION

561	ROTOR END
562	CONTACT
563	BUSHING
564	.190-32 X ½ RD. T. C. SEMS MACH. SCR
565	COVER
566	.164-32 X ¾ PAN BL. STL. SEMS MACH. SCR.
567	COVER
568	.164-32 X ⅜ PAN T. C. BL. STL. MACH. SCR.
569	COLLAR
570	.164-32 X ½ BD SI. BRZ. MACH. SCR.
571	CRIMP WASHER

* REPAIR PARTS

FIG. 12 — Auxiliary Switch

500	SHUNT TRIP FRAME
501	TRIP LEVER
502	PIN
503	STATIONARY CORE
504	MOVING CORE
505	PLATE
506	BRACKET
507	SLEEVE
*508	SPRING, RESET
509	SCREW
510	WASHER
511	BUSHING
512	COIL SPOOL
*513	COIL
514	LEADS
515	BOLTS
157	TRIP BAR

*REPAIR PARTS

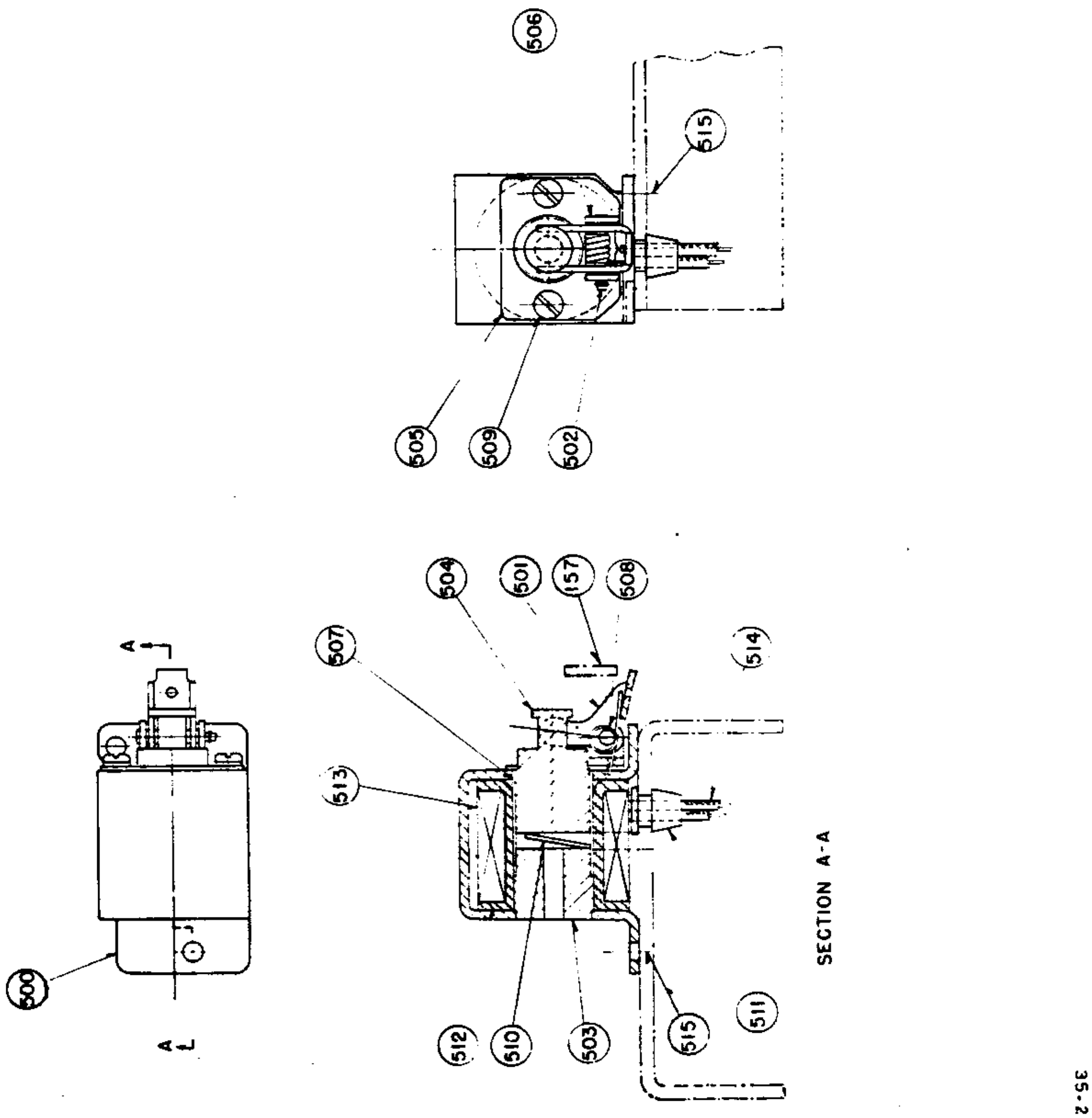


FIG. 13 — Shunt Trip Device

100	MOLDED BASE
105	LOWER STUD
600	YOKE
601	POLE PIECE
602	BEARING CASTING
603	ARMATURE
604	LUG
605	TRIP LEVER
606	LINK
607	BAND
608	ARM
609	LOCKING PIECE
610	CORE
611	5/16-18 X 3 1/4 FLAT HD.STL.MACH.SCREW
* 612	SPRING, CALIBRATION
613	CALIBRATION SCREW
614	1/4-20 SET SCREW

617	PIN
618	.190-32 X 1/2 PAN STL.SEMS MACH.SCR.
619	PIN
620	PIN
621	PIN
622	PIN
* 623	POTENTIAL COIL
624	SERIES COIL
625	TUBE
626	INSULATION
627	INSULATION
628	INSULATION
629	WASHER
630	1/2-13 X 1 7/8 HEX.STL.BOLT
631	3/8-16 X 2 HEX.STL.BOLT
632	3/8-16 X 1 1/2 HEX.STL.BOLT
633	1/2-13 X 1 3/4 HEX.STL.BOLT
634	CONNECTOR
635	CONNECTOR

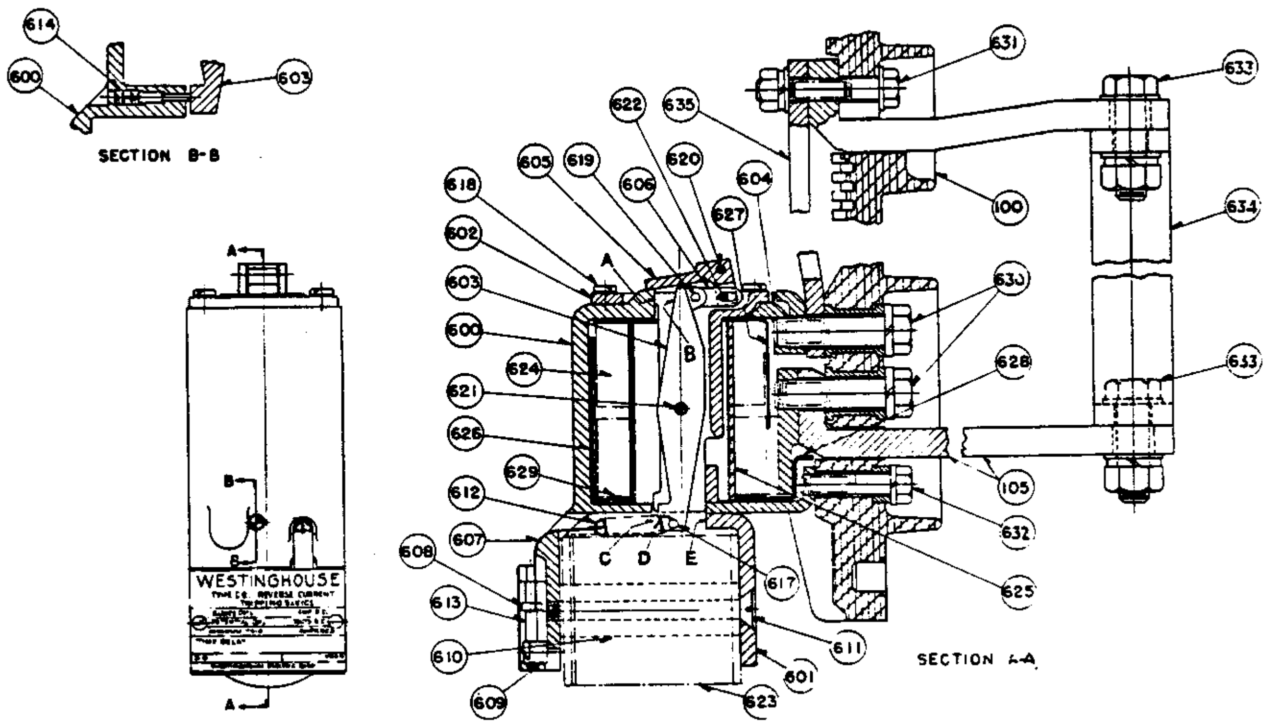


FIG. 14 — Reverse Current Trip Device

(60 rotate clockwise about fixed pin (620) in ing casting (602). This rotation causes the trip lever (605) to move trip screw (243) Figure 1 up thus causing the circuit breaker to trip. Slot in link (606) is to enable armature (603) to gain momentum before picking up the trip load.

Each of the coils of the device, the potential coil (623) and the series coil (624), has its own magnetic circuit. With forward current flowing in series coil (624), pole B is a south pole, say, and pole A is a north pole. At the bottom of the magnetic circuit of series coil (624), pole D is a north pole and pole C is a south pole as far as the series coil magnetic circuit is concerned. In the potential coil magnetic circuit, pole E is a north pole and pole C is a south pole as far as the potential coil magnetic circuit is concerned. It can be seen that under the circumstance of forward current flow in the series coil the magnetic pull between unlike poles C and D will hold armature (603) immobile since pole C is a strong south pole due to flux from both coils while pole D is a north pole due to flux of series coil.

hen the current in series coil (624) rever , poles A and B change their polarity to h and north respectively, and pole D cha to a south pole. Since pole E is still a north pole due to the potential coil, there is now an attraction between poles D and E where repulsion existed before. Pole C is still a south pole as far as the potential coil is concerned but has become a north pole with respect to the series coil. The net result is that pole C becomes very weak and as soon as the attraction between unlike poles A and B and the attraction between unlike poles D and E becomes strong enough to overcome the tension in calibration spring (612), the armature rotates counterclockwise and trips the circuit breaker as described before.

This device is set at the factory and should not be tampered with in the field. However, it may be necessary to make a field adjustment in case calibration spring (612) has been replaced.

(a) Remove two screws in nameplate and remove nameplate from device.

(b) Remove locking piece (609).

(c) alibration screw (613) has a square cross sec and may be turned with a small wrench. Tu screw (613) so that arm (608) moves dow creases the calibration setting of the device and turning it the other direction decreases the setting. The screw should be set so that the amount of reverse current indicated on the nameplate will just trip the circuit breaker.

REPLACEMENTS

(a) Calibration spring (612) can be easily replaced after removing the device from the circuit breaker. It is accessible without removing other parts. The device is removed from the breaker by removing bolts (630) and (632).

To replace potential coil (623):

(a) Disconnect wiring from terminal 4 of the auxiliary switch and from the bus as shown in wiring diagram Figure 2.

(b) Remove unit from the circuit breaker by removing bolts (630) and (632).

(c) Removing screw (611) frees the voltage coil for replacement.

NOTE: Any field adjustment of this device should be regarded as temporary pending recalibration.

D-15. UNDERVOLTAGE TRIP DEVICE

Reference Figure 15

FUNCTION

The function of this unit is to trip the circuit breaker when the line voltage drops below the nominal transient voltage level. The device is mounted on the front shelf of the circuit breaker and operates directly on the main trip bar to open the circuit breaker without intentional time delay on any condition from no voltage to drop out voltage rating. The device is automatically reset; that is, after it has dropped out and tripped the circuit breaker on reduced voltage, it will reset by the breaker action.

CHARACTERISTICS

Nominal Voltage, D-C	250
Operating Range, Volts	175-355
Pick-up and Seal Volts, Minimum	150
Dropout Voltage, Maximum	150
Minimum	25

The units are designed to withstand a minimum of 7500 operations and each device is furnished with two leads 24 inches long. The coil and connecting leads are fully insulated without exposed terminals or connections.

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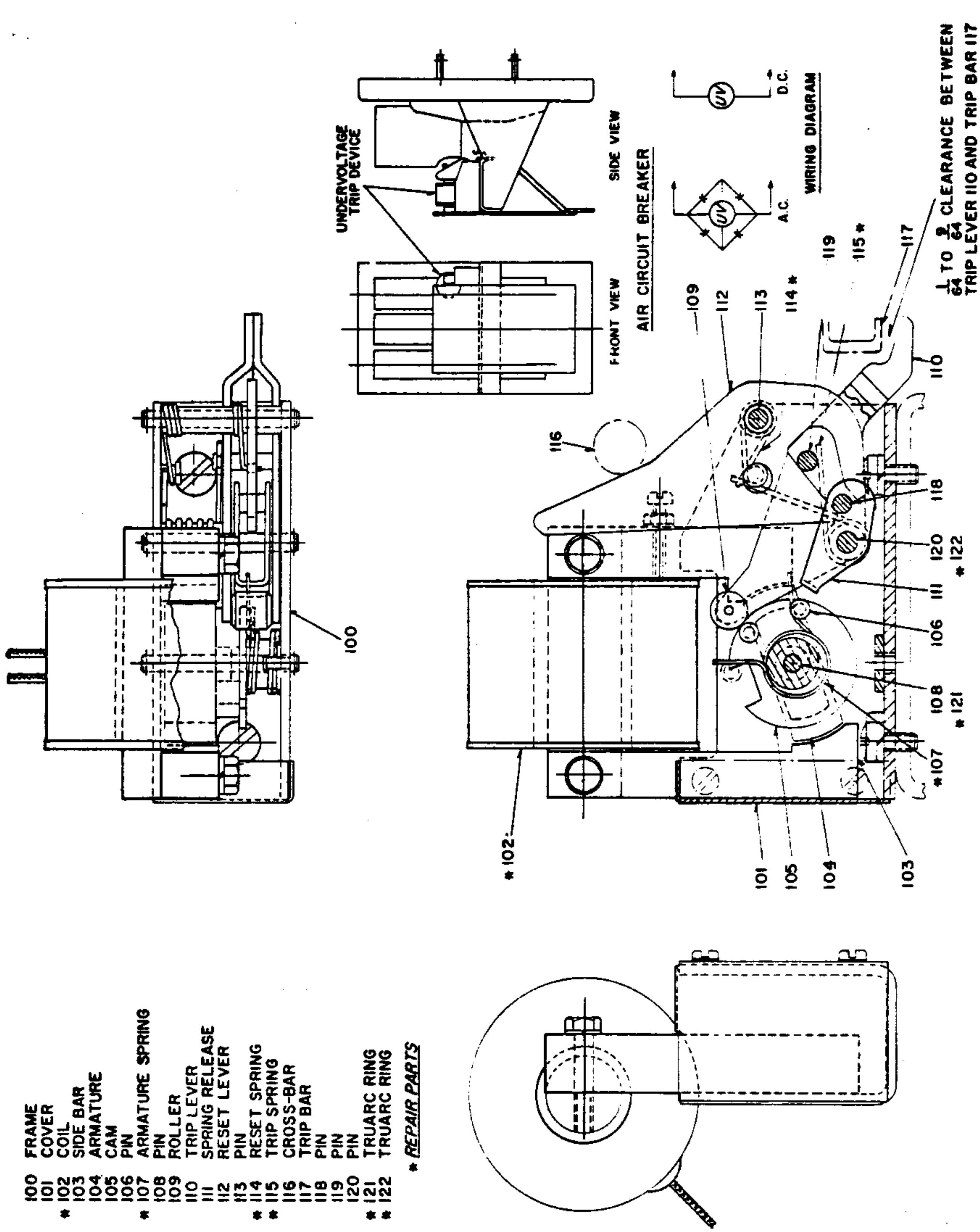

FIG. 15—Undervoltage Trip Device

OPERATION

The following operating cycle is performed when a closed circuit breaker with its undervoltage device energized at nominal voltage is subjected to a reduced voltage condition:

1. At nominal rated voltage the armature (104) is held in place between the pole faces against the torque of torsion spring (107) by the magnetic force. Roller (109) rests on the cam surface (105) and maintains lever (110) away from trip bar (117).

2. As the transient voltage falls below the drop out voltage the armature spring (107) rotates the armature and cam assembly clockwise until roller (109) is rotated into the cam slot by spring (115) and simultaneously the circuit breaker is tripped.

3. As the circuit breaker opens, the cross bar (116) rotates reset lever (112) counterclockwise about pin (113). The reset lever (112) rotates spring release (111) clockwise about pin (120) and removes the spring load on the armature-cam assembly. The reset-lever also rotates the trip lever (110) clockwise and releases the roller (109) out of the slot.

The following operating cycle is performed when the circuit breaker is being closed with the undervoltage device energized at nominal voltage after opening because of a low voltage condition:

1. After the line voltage restores to its nominal value the magnetic force aligns the armature with the pole faces. Then as the circuit breaker is closed the cross bar (116) releases the reset lever (112) and the trip lever (110). The trip lever (110) is rotated counterclockwise by spring (115) until roller (109) rests on the cam surface.

REPAIR PARTS

To replace the coil (102) remove the two pan head sems machine screws and pull the coil and its core up.

To replace the armature spring (107) remove the cover (101) and also slide the coil (102) up as explained above. Then release the spring from its stop on the side of the frame and remove the truarc rings from pin (108). Push pin (108) in until it frees the armature spring and its spacer and allows them to drop out the back. Replace the spring on the spacer, hold the undervoltage trip on its side, and slide the spring and spacer in from the back until the bent end slides on to the stop on the cam (105) and over the spring release (111). Push pin (108) thru the frame and replace the truarc rings. Then with a small hook pull the other end of the spring (107) on to its stop.

To replace the reset lever spring (114) release the spring from its stops and then remove the truarc rings from pin (113) and push it out of the frame. Rotate the spring (114) clockwise and slide it off the bushing.

To replace the trip spring (115) release it from its stops and then remove the truarc ring on the end of pin (120) nearest the magnetic circuit. Push pin (120) in until the spring and its spacer are freed. Slide the spring and spacer out the front.

ADJUSTMENTS

The clearance between trip lever (110) and circuit breaker (117) is not adjustable but should be as shown on Fig. 15.

DATA

1. Requirements of circuit breaker specification MIL-C-17587 apply

2. Qualification and shock test covered by Westinghouse Report T-122156 of 22 December 1956 and approved by BuShips Letter NObs 66853 (560K) SER 560-31768 of 22 January 1957

3. Westinghouse Drawing #900J075; BuShips #3,306,610 is the applicable master drawing

D-16. REPAIR PARTS

Potential coils, springs, arcing contacts, and auxiliary switches are supplied as repair parts. Refer to consolidated repair parts list for further details.